

Standards for Perchlorate in Drinking Water

Last Update: April 23, 1999

Status of Perchlorate Regulations

DHS' 1997 Action Level

Basis for DHS' Action Level

References

Status of Perchlorate Regulations

On January 7, 1999, the Department of Health Services (DHS) adopted a regulation identifying perchlorate as an unregulated chemical for which monitoring is required. Certain drinking water systems will need to sample their drinking water sources for perchlorate (see results of perchlorate sampling).

No federal or drinking water standards exist for perchlorate. DHS currently uses an advisory "action level" of 18 micrograms per liter, or part per billion (ppb). DHS uses an action level for a drinking water contaminant until a primary drinking water standard, or maximum contaminant level (MCL), is adopted. DHS has provided advice to drinking water systems about actions to be taken if the action level is exceeded.

MCLs require human health risk assessments. The US Environmental Protection Agency (US EPA) has completed a draft risk assessment (US EPA, 1998), which is available from the National Center for Environmental Assessment (NCEA). A revised risk assessment document is anticipated to be completed by NCEA in late 1999.

The California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) is performing an assessment that will focus on the human health risks associated with perchlorate exposures from drinking water. This assessment will result in a "public health goal" (PHG), which is used by DHS in the MCL development process. A PHG for perchlorate is expected to be completed by early 2000. Information on the PHG process is available from OEHHA.

DHS' 1997 Action Level

Following the initial northern California findings in February 1997, the DHS Drinking Water Program informed drinking water utilities that the US EPA had evaluated the health effects of perchlorate as part of its Superfund activities associated with hazardous waste sites (US EPA, 1992; US EPA, 1995). DHS, in cooperation with OEHHA, reviewed the US EPA reports on the risks to human health from exposure to perchlorate.

As a result of that review, DHS established its action level of 18 ppb. Perchlorate concentrations lower than 18 ppb are not considered to pose a health concern for the public, including children and

pregnant women.

Basis of DHS' Action Level

Table 1 presents a comparison of US EPA (1992) and US EPA (1995). Each used studies on humans as the most appropriate information for evaluating the health risks of perchlorate. Data were derived from medical patients given perchlorate to treat hyperactive thyroid glands (Graves' disease). The measure of effect was the release of iodine from the thyroid and inhibition of iodine uptake by the thyroid, which were the most sensitive indicators of effects. For these effects, the US EPA identified a no observed adverse effects level (NOAEL) of 0.14 mg/kg/day.

US EPA (1995) reviewed its 1992 report and material submitted by the Perchlorate Study Group, and maintained the earlier 1000-fold uncertainty (UF), but also included a 300-fold UF. In its 1995 report, US EPA acknowledged unanswered questions about perchlorate's chronic effects, citing concern about fatal bone marrow effects at doses ranging from 6 to 14 mg/kg/day.

Table 1. Comparison of various parameters from US EPA's evaluations of perchlorate.		
	US EPA, 1992	US EPA, 1995
NOAEL	0.14 mg/kg/day	0.14 mg/kg/day
Factor to account for use of a study of short duration, instead of a long-term "chronic" study	10	10
Factor to account for the protection of sensitive individuals, e.g., those with low iodine diets or with genetically impaired iodide accumulation systems in the thyroid	10	10
Factor to account for deficiencies in the data available on the effects of perchlorate	10	3-10
UF	1,000	300-1,000
Provisional Reference Dose (RfD) (=NOAEL/UF)	0.0001 mg/kg/day	0.0001-0.0005 mg/kg/day
Corresponding drinking water concentration, assuming 2 liters/ day and 70-kg body weight	4 ppb	4-18 ppb

A study by Stanbury and J.B. Wyngaarden (1952) provided the basis for determining the RfD. The NOAEL of 0.14 mg/kg/day is based on the studies of Graves' disease patients, using the release of iodine from the thyroid and inhibition of iodine uptake by the thyroid as the critical effect. Comparisons of drinking water concentrations derived from the NOAEL and US EPA's RfDs with concentrations corresponding to toxicologic endpoints are presented in Table 2.

Table 2. Drinking water concentrations that would result in thyroid effects or bone marrow effects, compared to concentrations derived from US EPA's Reference Doses.		
	4 ppb	18 ppb
Relative to thyroid effects ¹	12,000	2,700
Relative to fatal bone marrow effects ²	52,500-122,500	11,700-27,200
¹ Perchlorate above 1.4 mg/kg/day was reported to have adverse effects on the thyroid. In drinking water, this corresponds to 49,000 ppb (= 1,400 micrograms/kg/day x 70 kg body weight / 2 L/day)		
² Perchlorate at 6-14 mg/kg/day was reported to result in fatal bone marrow effects in Graves' disease patients treated for 2 months or longer. In drinking water, this corresponds to 210,000-490,000 ppb (= 6,000-14,000 micrograms/kg/day x 70 kg / 2 L/day =)		

References

Stanbury, J.B. and J.B. Wyngaarden, 1952. Effect of perchlorate on the human thyroid gland. *Metabolism* 1: 533-539

US EPA, 1992, Provisional Non-cancer and Cancer Toxicity Values for Potassium Perchlorate (CASRN 7778-74-7) (Aerojet General Corp./CA), Memorandum from Joan S. Dollarhide, Superfund Health Risk Technical Support Center, Environmental Criteria and Assessment Office, Office of Research and Development, to Dan Stralka, US EPA Region IX.

US EPA, 1995, Correspondence from Joan S. Dollarhide, National Center for Environmental Assessment, Office of Research and Development, to Mike Girrard, Chairman, Perchlorate Study Group.

US EPA, 1998, *Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization Based on Emerging Information*, External Review Draft, NCEA-1-0503, National Center for Environmental Assessment, December 31, 1998.

FOR MORE INFORMATION

For more information, please contact Dr. Steven Book of DHS' Drinking Water Program at (916) 323-6111.

[Return to Perchlorate Index](#)

[Return to Top of Page](#)

[Home](#)